PATENT
Atty Docket No. DE 020294
(79002-53)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT: Juergen Weese

EXAMINER: Saniay Cattungal

SERIAL NO.: 10/536,843

ART UNIT: 3768

FILED: MAY 31, 2005

CONFIRMATION NO.: 6524

FOR: APPARATUS AND METHOD FOR ASSISTING THE NAVIGATION OF A CATHETER IN A VESSEL

# APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Dear Sir:

Appellant herewith respectfully presents a Reply Brief as follows:

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1. REAL PARTY IN INTEREST

The real party in interest is the assignee of record Koninklijke Philips Electronics, N.V., an international corporation having an office and a place of business at Groenewoudseweg 1, Eindhoven, Netherlands 5621 BA.

2. RELATED APPEALS AND INTERFERENCES

Appellant and the undersigned attorney are not aware of any other appeals or interferences which will directly affect or be directly affected by or having a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Claims 1-20 are currently pending in the present application and are the claims on appeal. See, Claims Appendix.

Claims 1-20 stand finally rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Publication No. 2005/0107688 to *Strommer* et al.

Claims 1-20 further stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Publication No. 2003/0199767 to *Cespedes* et al. in view of U.S. Patent Publication 2005/0107688 to *Strommer* et al.

4. STATUS OF AMENDMENTS

Appellant filed an after final request for reconsideration under 37 C.F.R. §1.116 in response to a Final Office Action dated September 15, 2008. The request for reconsideration did not include any amendments to pending claims 1-20.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER

As illustrated in FIGS. 1 and 2 and claimed by independent claim 1, an apparatus for navigation in a vessel 2 comprises a catheter 1, a memory 8 and a data processing unit 7. The catheter 1 has a sensor probe 3 connected thereto and moving along the vessel 2 with the sensor probe 3 acquires local images 5,10 of cross-sections of the vessel 2 at the point where the particular local image is made. The memory 8 is for storing a sequence of the local images 5 that is obtained in the course of the movement of the sensor probe 3 along the vessel 2. The data-processing unit 7 is arranged to sort a further local image 10 of the vessel 2 into the sequence that is stored in the memory 8, the sorting being based on similarities between the further local image 10 and one or more of the local images 5 of the sequence. See, *U.S. Patent Application Serial No. 10/536,843* at page 6, line 6 to page 8, line 23.

As illustrated in FIGS. 1 and 2 and claimed by independent claim 5, a method of navigation in a vessel 2 comprises providing a catheter 1 with a sensor probe 3; moving, along the vessel 2, the sensor probe 3 and acquiring local images 5,10 of the vessel 2 at the point where the particular local image is made; storing a sequence of the local images 5 during the movement of the sensor probe 3; sorting a further local image 10, which is made by the sensor probe 3, into the sequence; and positioning a medical device 4 coupled to the catheter 1 based at least in part on the sorted further local image 10. See, *U.S. Patent Application Serial No. 10/536,843* at page 6, line 6 to page 8, line 23.

As illustrated in FIGS. 1 and 2 and claimed by independent claim 13, a method of positioning a medical device 4 in a vessel 2 comprises providing a catheter 1 with a sensor probe

3; moving the sensor probe 3 along the vessel 2 and acquiring local images 5,10 of the vessel 2 at the point where the particular local image is made; storing a sequence of the local images 5 during the movement of the sensor probe 3; connecting a medical device 4 to the catheter 1, the medical device 4 and the sensor probe 3 being separated along the catheter 1 at a known distance; moving the medical device 4 along the vessel 2 and acquiring a further local image 10 of the vessel 2 at the point where the particular further local image is made; sorting the further local image 10 into the sequence based on a similarity between the further local image 10 and one or more of the local images 5 of the sequence; and positioning the medical device 4 coupled to the catheter 1 based at least in part on the sorted further local image 10. See, *U.S. Patent Application Serial No. 10/536,843* at page 6, line 6 to page 8, line 23.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant appeals the final rejection of claims 1-20 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Publication No. 2005/0107688 to *Strommer* et al.

Appellant further appeals the final rejection of claims 1-20 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Publication No. 2003/0199767 to *Cespedes* et al. in view of U.S. Patent Publication 2005/0107688 to *Strommer* et al.

7. ARGUMENT

A. 35 U.S.C. §102(e) /§103(a) Rejections of Claims 1-20

The final §102(e)/§103(a) rejections of claims 1-20 is premised on the Examiner's respectful yet erroneous assertion that *Strommer* describes the following limitation of independent claims 1, 5 and 13 as well as dependent claims 8, 9, 16 and 17:

1. "a data-processing unit that is arranged to sort a further local image of the vessel into the sequence that is stored in the memory, the sorting being based on similarities between in the further local image and one or more of the local images of the sequence" as recited in independent claim 1;

2. "sorting a further local image, which is made by the sensor probe, into the sequence" and "positioning a medical device coupled to the catheter based at least in part on the sorted further local image" as recited in independent claim 5;

3. "sorting the further local image into the sequence based on a similarity between the further local image and one or more of the local images of the sequence" and "positioning the medical device coupled to the catheter based at least in part on the sorted further local image" as recited in independent claim 13;

4. "wherein the further local image is assigned to one or two adjacent images in the sequence with which the similarity of the further local image is greatest" as recited in dependent claim 8;

5. "wherein sorting of the further local image is performed repeatedly for a series of further local images, with the search for a sorted position in the sequence held in store, for an image in this series, beginning in each case at the sorted position of the previous further local image in the series" as recited in dependent claim 9;

6. "performing geometrical corrections to the local images based on pre-existing images" as recited in dependent claim 16; and

7. "determining the similarity between the further local image and the one or more of the local images of the sequence based on gray-value registration" as recited in dependent claim 17.

From this erroneous premise, the Examiner respectfully concludes that (1) *Strommer* anticipates claims 1-20, and (1) it would have been obvious to one of ordinary skill in the art at the time of the invention of claims 1-20 to render the subject matter of claims 1-20 based on *Cespedes* in view of *Strommer*.

B. *Strommer*.

The Appellant respectfully asserts that a careful review of *Strommer* reveals the failure of *Strommer* to teach or suggest the aforementioned limitations of independent claims 1, 5 and 13 as well as dependent claims 8, 9, 16 and 17.

Specifically, a careful review of *Strommer* reveals *Strommer* teaches delivering a stent (i.e., a medical device as recited in claims 5-20 herein) to a selected position within a lumen (i.e., vessel as recited in claims 1-20 herein) by a graphic designation on an image of the lumen of (1) a selected position of the stent within the lumen and (2) an indication when the stent has reached the selected position. This is accomplished by use of a medical positioning system ("MPS") constantly detecting the position of the stent relative to the selected position as represented on the image of the lumen. For example as shown in FIG. 6 of *Strommer*, a MPS sensor $210_1$ is attached to a catheter 222 delivering the stent, a MPS sensor $210_2$ is attached to a an image transducer 218, a MPS sensor $210_3$ is attached to an operating table, and a MPS sensor $210_N$ is attached to a patient 216 to thereby constantly detect the position of the stent relative to the selected position. See, *Strommer* at paragraphs [0058] and [0110]-[0116].

Further review of *Strommer* reveals the fact that the only image sorting activity taught by *Strommer* is for purposes of reconstructing a three-dimensional ("3D") image of a volume from a sequence of two-dimensional ("2D") images derived from a transducer moving within the lumen and from the 3D location and orientation of the sequence of 2D images obtained from the MPS sensors. Specifically, as shown in FIG. 9, *Strommer* teaches an internal transducer 254 (FIG. 7A) for capturing a sequence of 2D images 252A-252S as transducer 254 is moved within a

lumen and detected via MPS sensors 258 and 260 (FIG. 7A). The capturing of these 2D images 252A-252S are synchronized with an organ timing signal 272. To reconstruct a 3D image of a volume, the sequence of 2D images 252A-252S is sorted into volumes 274A-274D as shown in FIG. 10A based on the synchronized timing position of each 2D image relative to an organ timing signal 272. The timing position of each 2D image is either organ timing signal cycle location T, 1/4T, 1/2T or 3/4T. As shown in FIGS. 10B and 10C, this sorting serves as the basis for the reconstruction and updating of 3D volumes 276 in view of the 3D location and orientation of each 2D image 252 obtained from the MPS sensors 258 and 260. See, *Strommer* at paragraphs [0128]-[0149].

In the context of properly understanding the only sorting activity of *Strommer*, the Appellant respectfully asserts that *Strommer* unequivocally fails to describe, expressly or inherently, sorting a further 2D image into the sequence of 2D images 252A-252S, particularly based on one or more similarities between the further 2D image and one or more of the 2D images 252A-252S. Furthermore, the Appellant respectfully asserts that *Strommer* unequivocally fails to describe, expressly or inherently, positioning a stent within a lumen based entirely or partially on the sorting of the further 2D image into the sequence of 2D images 252A-252S. The reason for these description failures by *Strommer* is *Strommer* is based on using MPS sensors for detecting the position of the stent within the lumen as opposed to sorting further 2D images of the lumen into a sequence of 2D images for positioning the stent within the lumen as encompassed by the aforementioned limitations of independent claims 1, 5 and 13 as well as dependent claims 8, 9, 16 and 17.

C. Allowance of Claims 1-20 over *Strommer*.

(1) Anticipation. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

In view of the fact that *Strommer* fails to describe, expressly or inherently, an apparatus and a method for navigation in a vessel encompassing a local image storage and sorting as taught by the present application, the Appellant respectfully asserts *Strommer* fails to anticipate claims 1-20 as grouped herein.

(2) Group 1: Claims 1-7, 11-15, and 18-20. The Appellant respectfully traverses the §102(e) rejection of independent claims 1, 5 and 13, because *Strommer* fails to describe, expressly or inherently, "a data-processing unit that is arranged to sort a further local image of the vessel into the sequence that is stored in the memory, the sorting being based on similarities between in the further local image and one or more of the local images of the sequence" as recited in independent claim 1; "sorting a further local image, which is made by the sensor probe, into the sequence" and "positioning a medical device coupled to the catheter based at least

in part on the sorted further local image" as recited in independent claim 5; and "sorting the further local image into the sequence based on a similarity between the further local image and one or more of the local images of the sequence" and "positioning the medical device coupled to the catheter based at least in part on the sorted further local image" as recited in independent claim 13.

Withdrawal of the rejection of independent claims 1, 5 and 13 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

Claims 2-4 and 12 depend from independent claim 1. Therefore, dependent claims 2-4 and 12 include all of the elements and limitations of independent claim 1. It is therefore respectfully submitted by the Appellant that dependent claims 2-4 and 12 are allowable over *Strommer* for at least the same reason as set forth herein with respect to independent claim 1 being allowable over *Strommer*. Withdrawal of the rejection of dependent claims 2-4 and 12 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

Claims 6, 7, 10 and 11 depend from independent claim 5. Therefore, dependent claims 6, 7, 10 and 11 include all of the elements and limitations of independent claim 5. It is therefore respectfully submitted by the Appellant that dependent claims 6, 7, 10 and 11 are allowable over *Strommer* for at least the same reason as set forth herein with respect to independent claim 5 being allowable over *Strommer*. Withdrawal of the rejection of dependent claims 6, 7, 10 and 11 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

Claims 14, 15 and 18-20 depend from independent claim 13. Therefore, dependent claims 14, 15 and 18-20 include all of the elements and limitations of independent claim 13. It is

therefore respectfully submitted by the Appellant that dependent claims 14, 15 and 18-20 are allowable over *Strommer* for at least the same reason as set forth herein with respect to independent claim 13 being allowable over *Strommer*. Withdrawal of the rejection of dependent claims 14, 15 and 18-20 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

(3) Group II: Claim 8. The Appellant respectfully traverses the §102(e) rejection of dependent claim 8, because *Strommer* fails to describe, expressly or inherently, "wherein the further local image is assigned to one or two adjacent images in the sequence with which the similarity of the further local image is greatest" as recited in independent claim 8. Withdrawal of the rejection of dependent claim 8 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

(4) Group III: Claim 9. The Appellant respectfully traverses the §102(e) rejection of dependent claim 9, because *Strommer* fails to describe, expressly or inherently, "wherein the sorting of the further local image is performed repeatedly for a series of further local images, with the search for a sorted position in the sequence held in store, for an image in this series, beginning in each case at the sorted position of the previous further local image in the series" as recited in independent claim 9. Withdrawal of the rejection of dependent claim 9 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

(5) Group IV: Claim 16. The Appellant respectfully traverses the §102(e) rejection of dependent claim 16, because *Strommer* fails to describe, expressly or inherently, "performing geometrical corrections to the local images based on pre-existing images" as recited in independent claim 16. Withdrawal of the rejection of dependent claim 16 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

(6) Group V: Claim 17. The Appellant respectfully traverses the §102(e) rejection of dependent claim 17, because *Strommer* fails to describe, expressly or inherently, "determining the similarity between the further local image and the one or more of the local images of the sequence based on gray-value registration" as recited in independent claim 17. Withdrawal of the rejection of dependent claim 17 under 35 U.S.C. §102(e) as being anticipated by *Strommer* is therefore respectfully requested.

D. *Cespedes*.

*Cespedes* teaches an image-temperature correlation system for identifying and stabilizing vulnerable plaque via multi-functional catheters having both thermography and imaging capabilities. The Appellant respectfully asserts that a careful review of *Cespedes* reveals the fact that the image-temperature correlation system of *Cespedes* fails to teach or suggest the aforementioned limitations of independent claims 1, 5 and 13 as recognized by the Examiner. Furthermore, the Appellant has clearly demonstrated herein the failure of *Strommer* to teach or

suggest the aforementioned limitations of independent claim 1, 5 and 13 as well as dependent claims 8, 9, 16 and 17. Thus, from a proper reading of the cited references, the Appellant respectfully asserts that one skilled in the art at the time of the invention of claims 1, 5, 8, 9, 13, 16 and 17 would have read the cited references in combination as teaching at best a modification of image-temperature correlation system of *Cespedes* to include the 3D image reconstruction technique of *Strommer* based on using MPS sensors for detecting the position of the stent within the lumen. Moreover, the Appellant respectfully asserts that any deviation from the MPS sensor based 3D image reconstruction technique of *Strommer* in the direction of sorting further 2D images of the lumen into a sequence of 2D images for positioning the stent within the lumen, particularly based on similarities of the images, would improperly change the principle operation of the image-temperature correlation system *Cespedes* in view of *Strommer*. Thus, the cited references in combination would not rendered claims 1, 5, 8, 9, 13, 16 and 17 obvious to one skilled in the art at the time of the invention of claims 1, 5, 8, 9, 13, 16 and 17.

E. Allowance of Claims 1-20 over *Cespedes* in view of *Strommer*.

(1) Obviousness. Obviousness in this case is a question of law based on underlying factual inquiries of (1) determining the scope and content of *Cespedes* and *Strommer*, (2) ascertaining the differences between claims 1-20 and the combination of *Cespedes* and *Strommer*; and (3) resolving the level of ordinary skill in the pertinent art of vessel navigation.

From the factual inquires, the focus on making a determination of obviousness should be on what a person of ordinary skill in the pertinent art of vessel navigation would have known from the combination of *Cespedes* and *Strommer* at the time of the invention of claims 1-20 and on what such a person would have reasonably expected to have been able to do in view of the knowledge from the combination of *Cespedes* and *Strommer*. See, MPEP 2141.

In view of the facts that the a modification of image-temperature correlation system of *Cespedes* to include the 3D image reconstruction technique of *Strommer* based on using MPS sensors for detecting the position of the stent within the lumen would not include aforementioned limitations of claims 1, 5, 8, 9, 16 and 17, and any deviation from the MPS sensor based 3D image reconstruction technique of *Strommer* in the direction of sorting further 2D images of the lumen into a sequence of 2D images for positioning the stent within the lumen, particularly based on similarities of the images, would improperly change the principle operation of the image-temperature correlation system *Cespedes* in view of *Strommer*, the Appellant respectfully asserts that a person of ordinary skill in the pertinent art of vessel navigation would NOT have been expected to combine *Cespedes* and *Strommer* in order to invent claims 1-20 at the time of the invention of claims 1-20 as grouped herein.

(2) Group 1: Claims 1-7, 11-15, and 18-20. The Appellant respectfully traverses the §103(a) rejection of independent claims 1, 5 and 13, because *Strommer* fails to render obvious "a data-processing unit that is arranged to sort a further local image of the vessel into the sequence that is stored in the memory, the sorting being based on similarities between in the

further local image and one or more of the local images of the sequence" as recited in independent claim 1; "sorting a further local image, which is made by the sensor probe, into the sequence" and "positioning a medical device coupled to the catheter based at least in part on the sorted further local image" as recited in independent claim 5; and "sorting the further local image into the sequence based on a similarity between the further local image and one or more of the local images of the sequence" and "positioning the medical device coupled to the catheter based at least in part on the sorted further local image" as recited in independent claim 13.

Withdrawal of the rejection of independent claims 1, 5 and 13 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

Claims 2-4 and 12 depend from independent claim 1. Therefore, dependent claims 2-4 and 12 include all of the elements and limitations of independent claim 1. It is therefore respectfully submitted by the Appellant that dependent claims 2-4 and 12 are allowable over *Cespedes* in view of *Strommer* for at least the same reason as set forth herein with respect to independent claim 1 being allowable over *Cespedes* in view of *Strommer*. Withdrawal of the rejection of dependent claims 2-4 and 12 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

Claims 6, 7, 10 and 11 depend from independent claim 5. Therefore, dependent claims 6, 7, 10 and 11 include all of the elements and limitations of independent claim 5. It is therefore respectfully submitted by the Appellant that dependent claims 6, 7, 10 and 11 are allowable over *Cespedes* in view of *Strommer* for at least the same reason as set forth herein with respect to independent claim 5 being allowable over *Cespedes* in view of *Strommer*. Withdrawal of the

rejection of dependent claims 6, 7, 10 and 11 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

Claims 14, 15 and 18-20 depend from independent claim 13. Therefore, dependent claims 14, 15 and 18-20 include all of the elements and limitations of independent claim 13. It is therefore respectfully submitted by the Appellant that dependent claims 14, 15 and 18-20 are allowable over *Cespedes* in view of *Strommer* for at least the same reason as set forth herein with respect to independent claim 13 being allowable over *Cespedes* in view of *Strommer.* Withdrawal of the rejection of dependent claims 14, 15 and 18-20 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

(3) Group II: Claim 8. The Appellant respectfully traverses the §103(a) rejection of dependent claim 8, because *Strommer* fails to render obvious "wherein the further local image is assigned to one or two adjacent images in the sequence with which the similarity of the further local image is greatest" as recited in independent claim 8. Withdrawal of the rejection of dependent claim 8 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

(4) Group III: Claim 9. The Appellant respectfully traverses the §103(a) rejection of dependent claim 9, because *Strommer* fails to render obvious "wherein the sorting of the further local image is performed repeatedly for a series of further local images, with the search for a sorted position in the sequence held in store, for an image in this series, beginning in

each case at the sorted position of the previous further local image in the series" as recited in independent claim 9. Withdrawal of the rejection of dependent claim 9 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

(5) Group IV: Claim 16. The Appellant respectfully traverses the §103(a) rejection of dependent claim 16, because *Strommer* fails to render obvious "performing geometrical corrections to the local images based on pre-existing images" as recited in independent claim 16. Withdrawal of the rejection of dependent claim 16 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

(6) Group V: Claim 17. The Appellant respectfully traverses the §103(a) rejection of dependent claim 17, because *Strommer* fails to render obvious "determining the similarity between the further local image and the one or more of the local images of the sequence based on gray-value registration" as recited in independent claim 17. Withdrawal of the rejection of dependent claim 17 under 35 U.S.C. §103(a) as being unpatentable over *Cespedes* in view of *Strommer* is therefore respectfully requested.

The Appellant respectfully submits that claims 1-20 as listed herein fully satisfy the requirements of 35 U.S.C. §§102, 103 and 112. In view of the foregoing, favorable consideration and early passage to issue of the present application is respectfully requested.

Respectfully submitted,

Dated: February 17, 2009

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## CLAIMS APPENDIX

1. An apparatus for navigation in a vessel, comprising:

a catheter having a sensor probe connected thereto, the sensor probe acquiring local images of cross-sections of the vessel at the point where the particular local image is made, the sensor probe being movable along the vessel;

a memory for storing a sequence of the local images that is obtained in the course of the movement of the sensor probe along the vessel;

a data-processing unit that is arranged to sort a further local image of the vessel into the sequence that is stored in the memory, the sorting being based on similarities between the further local image and one or more of the local images of the sequence.

2. An apparatus as claimed in claim 1, wherein the sensor probe is an intravascular ultrasound system.

3. An apparatus as claimed in claim 1, wherein the sensor probe moves along the vessel at a defined speed.

4. An apparatus as claimed in claim 1, further comprising a display for showing a stored sequence of the local images, wherein at least one of a position of the sensor probe and a position of an instrument that is in a known position relative to the sensor probe is indicated on the

display.

5. A method of navigation in a vessel, comprising:

providing a catheter with a sensor probe;

moving, along the vessel, the sensor probe and acquiring local images of the vessel at the point where the particular local image is made;

storing a sequence of the local images during the movement of the sensor probe;

sorting a further local image, which is made by the sensor probe, into the sequence; and

positioning a medical device coupled to the catheter based at least in part on the sorted further local image.

6. A method as claimed in claim 5, wherein the local images are cross-sectional intravascular ultrasound images of the vessel .

7. A method as claimed in claim 5, wherein the movement of the sensor probe for acquiring the sequence of local images takes place at a defined speed and the generation of local images takes place at a defined rate.

8. A method as claimed in claim 5, wherein the further local image is assigned to one or two adjacent images in the sequence with which the similarity of the further local image is greatest.

9. A method as claimed in claim 5, wherein the sorting of the further local image is performed repeatedly for a series of further local images, with the search for a sorted position in the sequence held in store, for an image in this series, beginning in each case at the sorted position of the previous further local image in the series.

10. A method as claimed in claim 5, wherein the local images in the sequence are shown on a display in line with their positions along the vessel.

11. The method of claim 5, wherein the local images and the further local image are acquired by the sensor probe through performing optical coherence tomography.

12. The apparatus of claim 1, wherein the local images and the further local image are acquired by the sensor probe through performing optical coherence tomography.

13. A method of positioning a medical device in a vessel, comprising:

providing a catheter with a sensor probe;

moving the sensor probe along the vessel and acquiring local images of the vessel at the point where the particular local image is made;

storing a sequence of the local images during the movement of the sensor probe;

connecting a medical device to the catheter, the medical device and the sensor probe being separated along the catheter at a known distance;

moving the medical device along the vessel and acquiring a further local image of the vessel at the point where the particular further local image is made;

sorting the further local image into the sequence based on a similarity between the further local image and one or more of the local images of the sequence; and

positioning the medical device coupled to the catheter based at least in part on the sorted further local image.

14. The method of claim 13, further comprising moving the sensor probe along the vessel by pulling motion.

15. The method of claim 13, wherein the medical device is a stent.

16. The method of claim 13, further comprising performing geometrical corrections to the local images based on pre-existing images.

17. The method of claim 13, further comprising determining the similarity between the further local image and the one or more of the local images of the sequence based on gray-value registration.

18. The method of claim 13, wherein the local images and the further local image are acquired using ultrasound imaging.

19. The method of claim 13, wherein the local images and the further local image are acquired using optical coherence tomography.

20. The method of claim 13, wherein the local images are obtained by moving the sensor probe at a constant rate and acquiring the local images at a constant rate.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.